Available online at http://www.ijasrd.org/in

International Journal of Advanced Scientific
Research & Development

Vol. 04, Iss. 03, Ver. II, Mar' 2017, pp. 130 – 148

e-ISSN: 2395-6089
p-ISSN: 2394-8906

DOES HEDGING IS NEEDED TO FOREIGN EXCHANGE RISK CONFRONTED BY CHEMICAL INDUSTRY OF INDIA

K. R. Pundareeka Vittala[1] and **Dr. B. Prakash**[2]

[1] Research Scholar, Management, Regn. No., PPMAN-0779, Rayalaseema University, Kurnool, Andhrapradesh.

[1] Professor & Hod, PG Commerce Department, Presidency College, Bangalore.

[2] Research Guide, Rayalaseema University, Kurnool.

[2] Professor, Department of MBA, Acharya Institute of Technology, Bangalore.

ARTICLE INFO

Article History:

Received: 27 Mar 2017;
Received in revised form:
28 Mar 2017;
Accepted: 29 Mar 2017;
Published online: 29 Mar 2017.

Key words:

Foreign exchange exposure,
Hedging techniques,
Derivatives,
Chemical industry

ABSTRACT

Chemical industry is one among the augmenting sector in manufacturing of India. It is budding at the rate of 13% p.a and contributing 2.11% to GDP. 100% FDI is permitted to chemical industry. Total FDI into chemical industry was about 109 Billion for the span of 2000 to 2015. Contribution to total chemical industry by its sub segments are Bulk chemicals contributes 39% Agro chemical constitutes 20.3%, specialty chemicals 19%, balance is from petro chemicals. Agro chemical industry imports a large volume (MT'S) of Urea, NPK & DAP from foreign countries preferably china & Saudi but there invoices are majorly denominated in USD. Other chemical industry also imports from the advantageous sources which can afford competitive prices but it is denominated majorly in USD. Volatility of exchange rate erodes the profits of the firm. At this point in time, The author has made an effort, to examine the exchange exposure and its impact on exchange losses emerging in chemical industry. This is being analyzed through data gathered from annual reports and summarized for meaning full analysis. ANOVA and predictive analysis (multiple regression test) is used for analysis. Models have been developed to estimate the exchange losses and choice of derivative. The study also reveals major currencies involved in the international operations and kind of currency derivative used for hedging the foreign exchange losses.

Copyright © 2017 IJASRD. This is an open access article distributed under the Creative Common Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

How to cite this article: Vittala, P. K. R., & Prakash, B., (2017). "Does Hedging is Needed to Foreign Exchange Risk Confronted by Chemical Industry of India". *International Journal of Advanced Scientific Research & Development (IJASRD), 04* (03/II), pp. 130 – 148.

INTRODUCTION

Chemical industry is one among the augmenting sector in manufacturing. It is essential for the growth of agro based economy like India It comprises of segments like agro chemicals, commodity chemicals specialty chemicals. This industry also supplies intermediate component to pharmaceuticals, textiles, plastics & paints. It is budding at the rate of 13%p.a and contributing 2.11% to GDP. 100% FDI is permitted to chemical industry. Total FDI into chemical industry was about 109 Billion for the span of 2000 to 2015. Contribution to total chemical industry by its sub segments are Bulk chemicals contributes 39% Agro chemical constitutes 20.3%, specialty chemicals 19%, balance is from petro chemicals.

Agro chemical industry imports a large volume (MT'S) of Urea, NPK & DAP from foreign countries preferably china & Saudi but there invoices are majorly denominated in USD. Inadequate provisions and delay in payment of subsidy by the government adversely affects the profitability of agro chemical industry. Other chemical industry also imports from the advantageous sources which can afford competitive prices but it is denominated majorly in USD. Volatility of exchange rate erodes the profits of the firm.

1.1 Major Concern for the Study

To protect against erosion of profit due to exchange losses, it is inevitable to deploy internal and external techniques foreign exchange risk management practices. Internal techniques do not assure the promised result, due to the interface of external environment factors such as inflation, business cycle etc. these are un controllable and un predictable. As a part corporate foreign exchange risk management practice, firms are indeed has to use currency derivatives to hedge against foreign exchange risk.

The main concern that will be addressed through this research paper is "To study what are the diverse external hedging instrument like forwards, futures, options and swap are used, for sinking currency risk for chosen Indian chemical companies listed on BSE. These chemical industries are ordinarily having massive foreign exchange outflow rather than receiving. Large amount of forex reserves need to spent on imports of Urea, NPK and DPA and royalty fee on technical knowhow.

1.2 Literature Review

Belk and Glaum (1990) report the results of an empirical study undertaken during 1988 on how UK multinational corporations try to manage their foreign exchange exposure. The study was based upon research conducted in 17 major UK industrial companies. Majority of the respondents feels transaction exposure management was seen a centerpiece of their foreign exchange risk management. Despite the financial literature demonstrating that accounting exposure is not a useful concept for foreign exchange risk management, the study found that a majority of companies were inclined to manage their accounting exposure actively. Further surveyed MNC's showed a lower degree of centralization and the majority of respondents described their companies as 'totally risk averse'.

Batten, Mellor and Wan (1993) conducted industry-wide, cross-sectional study on *foreign exchange risk management* practice and product usage of large Australian-based firms. Results are discussed from an empirical field study of seventy-two firms operating in Australia. Study finds that all firms hedge foreign exchange exposure. Survey finds that 61 percent of the Australian firms manage transaction exposure only, 8 percent manage transaction and translation and 17 percent manage all three exposures (other 14% have not given their response). They found that Australian firms were using both physical and synthetic products to offset the cash flows generated by the firm's *foreign* operations and trade. The synthetic products used by these sample firms included futures, options, swaps and option products. The physical products included spot, forwards, forward forwards and short and long-term physical swaps. The survey suggested extensive use of synthetics by the corporate sector with 35 firms (49 percent) using both physical and synthetic products, four firms (6 percent) using only synthetic products and the remaining 33 (46 percent) using physical products exclusively.

Bodnar, Hayt and Marston (1995) conducted a survey of derivatives usage by US non-financial firms. Out of 350 firms took part in the survey, 176 from the manufacturing sector, 77 from the primary products sector which includes agriculture, mining, and energy as well as utilities, and 97 from the service sector. The study found that 76 percent of all derivatives users in their survey manage foreign exchange risk using some foreign currency derivative or the other. This percentage makes foreign currency derivatives the most commonly used class of derivatives among the surveyed respondents. Among the types of foreign currency derivatives, the firms use, the forward contract is the most popular choice. More than 75 percent of firms rank the forward contract as one of their top three choices among foreign currency derivative instruments with over 50 percent ranking it as their first choice. OTC options are also a popular foreign currency derivative instrument, with about 50 percent of the firms choosing this as one of their top choices. Among the remaining instruments, swaps and futures are the most popular.

Jesswein, Kwok and Floks (1995) analyses and documents the extent of awareness and use of currency risk management's products by US Corporations. Based on the survey of Fortune 500 Companies, they conclude that traditional forward contract is the most popular derivative product with 93% using the same followed by currency swaps (53%) and OTC Options (49%).Many recent hybrid products were least preferred by respondents.

Type of Product Awareness	**(in %)**	**Usage (in %)**
Forward Contract 100 93.1	100	93.1
Foreign currency Swaps 98.8 52.6	98.8	52.6
Foreign currency futures 98.8 20.1	98.8	20.1
Exchange traded currency options 96.4 17.3	96.4	17.3
Exchange traded futures options 95.8 8.9	95	8.89
OTC Currency options 93.5 48.8	93.5	48.8
Cylinder Options 91.2 28.7	91.2	28.7
Synthetic forwards 88 22	88	22
Synthetic options 88 18.6	88	18.6
Participating forwards, etc. 83.6 15.8	83	15.8
Forward exchange agreements, etc. 81.7 14.8	81.7	14.8
Foreign currency warrants 77.7 4.2	77.7	77.7
Break forwards 65.3 4.9	65	4.9
Compound Options 55.8 3.8	55.8	3.8
Lookback Options. Etc. 52.1 5.1	52.1	5.1
Average across products 84.4 23.9	84.4	23.9

Grant and Marshall (1997) conducted a survey of large UK companies to ascertain their usage of derivatives. They examined the extent of derivatives usage, the reasons behind their usage, the perceived risk associated with derivatives, the control mechanism to monitor the derivatives used and the reporting practices which governed the usage of derivatives. The results of the survey indicated widespread usage of derivatives like swaps, forwards and options. The primary reason for their use was to manage interest rate and currency risks. There was a rather limited but growing use of derivatives to manage commodity and equity risks. Treasurers of the sampling firms reported that they were somewhat cautious about more exotic types of derivatives, primarily because of concern over the illiquidity of the underlying market for these derivatives. Interestingly, they revealed that they viewed control and the nature of their counterparty as the main risk in using derivatives. Finally, the use of derivatives was accompanied by significant control mechanism within the firms.

1.3 Research Gap

The present study is different from other empirical investigations carried out in India relating to the problem of currency exposure. Hence there is a need for the present study.

1.4 Objective of Study & Hypoyheses

1. To acquire understanding about foreign exchange exposure transpired to the foremost companies in chemical industry listed on BSE.
2. To Study the impact of such foreign exchange exposure on foreign exchange loss or gain and profitability of the selected companies.
3. To examine the different currencies, they are exposed to and derivative instruments used for hedging such exchange risk.

1.4.1 Hypoyheses

- **H_{01}:** Foreign exchange exposure among the chosen companies for remains uniform, irrespective of size of the firm
- **H_{02}:** Foreign exchange exposure has bearing on profitability of the firm to the greater extent.
- **H_{03}:** Foreign exchange losses can be substantially minimised through currency derivatives and multiple currency invoicing

1.5 Research Design

The study basically follows “Descriptive Study” particularly through the study of secondary sources like annual reports of various auto part makers.

RESEARCH METHODOLOGY

Sample population	Indian chemical manufacturing Companies involved in international trade either in import or export.
Sample unit	10 Indian chemical parts manufacturing companies from Chemical industry listed on BSE Base material index are chosen for the study

Design	Descriptive
Sampling method	Convenient sampling, only listed companies are taken for the study

Reason for taking this industry: Agro chemical industry imports a large volume (MT'S) of Urea, NPK & DAP from foreign countries preferably china & Saudi but their invoices are majorly denominated in USD. Inadequate provisions and delay in payment of subsidy by the government adversely affects the profitability of agro chemical industry. Other chemical industry also imports from the advantageous sources which can afford competitive prices but it is denominated majorly in USD. Volatility of exchange rate erodes the profits of the firm.

2.1 Limitations of the Study

1) The study being confined to 7 financial years 2009-2016.
2) Secondary data as published by annual reports is used for analysis.

2.2 Methods of Data Collections

Overall research paper will be based on secondary data provided by selected companies in:

1) Annual report of Financial Year 2009-10 to 2015-16.
2) Official websites of companies
3) Market research reports

2.3 Data Preparation

The data will be critically analyzed and conclusion will be based on data provided by companies, through its annual reports. The information on conservation of energy, technology absorption and foreign exchange earnings and outgo stipulated under Section 134(3)(m) of the Act, read along with Rule, 8 of the Companies (Accounts) Rules, 2014 is to be annexed along with director's report.

Accounting Standard 30 - Financial Instruments: Recognition and Measurement derivative instruments used need to be specified in financial statements. Accounting standard 11 – foreign exchange transaction and translations loss/ gain need to be recorded in profit and loss account. For the purpose of analysis such valid and reliable information is used. It is compiled in accordance with requirement of author.

DATA ANALYSIS

Table 1: *Gujarath State Fertilisers and Chemical Ltd.*

(Rs.in Crores)

Year	Total revenue	Foreign Exchange Inflow	Foreign Exchange outflow	Net Exposure	Net exchange (loss) /Gain	Net Profit	% of exchange loss on Net Profit	Derivatives Used	Exposure in
2009-10	4,132.06	83.31	1,452.11	-1,368.80	23.15	254.47	9.10	FORWARDS, FUTURES,	USD EURO
2010-11	4,856.25	83.68	1,447.25	-1,363.57	-38.87	749.37	-5.19		

2011-12	5,463.91	145.00	1,564.93	-1,419.93	-23.84	757.57	-3.15	OPTIONS, SWAPS	
2012-13	6,391.39	78.49	1,416.28	-1,337.79	-49.05	518.10	-9.47		
2013-14	5,537.03	46.51	1,505.21	-1,458.70	-60.27	342.17	-17.61		
2014-15	5,426.50	41.29	1,050.78	-1,009.49	-25.06	400.51	-6.26		
2015-16	6,227.54	31.35	1,399.76	-1,368.41	-47.09	379.85	-12.40		

(Compiled by the Author from Annual Reports)

Descriptive statistics	Total revenue	Foreign Exchange Inflow	Foreign Exchange outflow	Net Exposure	Net exchange (loss) /Gain	Net Profit	% of exchange loss on Net Profit
Mean	5433.53	72.80	1405.19	-1332.38	-31.58	486.01	-6.42
Standard Deviation	773.17	38.46	165.96	148.05	27.45	198.75	8.40
Range	2259.33	113.65	514.15	449.21	83.42	503.10	26.71
Minimum	4132.06	31.35	1050.78	-1458.70	-60.27	254.47	-17.61
Maximum	6391.39	145.00	1564.93	-1009.49	23.15	757.57	9.10
Sum	38034.68	509.63	9836.32	-9326.69	-221.03	3402.04	-44.97

From the above table, it is possible to infer that total revenue earned by GSFC for the period of 2009 to 2016 is Rs.38034.68Cr. out of which foreign exchange loss accrued to the company is Rs.221.03Cr. average exchange loss amounted to be Rs.31.58Cr. average net exposure is -1332.38 which 24.51% of average revenue. Co efficient variation on exchange loss is about 86.92% (27.45/31.58) which indicates that the exchange losses are consistent to the extent of 87%. Its range of exchange losses to gain is too wide that is 83.42Cr. Hence, there is a need for foreign exchange risk management tools, which are inevitable to minimize the foreign exchange losses.

GSFC has employed all the four-currency derivative i.e. Forwards, Futures, options & swaps have been used to minimize its foreign exchange risk. It has an exposure in two majorly traded currencies that is USD & EURO.

Table 2: *National Fertilisers Ltd.*

(Rs.in Crores)

Year	Total revenue	Foreign Exchange Inflow	Foreign Exchange outflow	Net Exposure	Net exchange (loss) /Gain	Net Profit	% of exchange loss on Net Profit	Derivatives Used	Exposure in
2009-10	5,148.96	0.00	94.24	-94.24	1.72	171.50	1.00	NIL	USD
2010-11	5,837.15	0.00	24.95	-24.95	1.92	138.50	1.39		
2011-12	7,342.66	0.00	319.71	-319.71	-2.77	126.73	-2.19		
2012-13	6,756.85	0.00	227.19	-227.19	-2.23	-170.73	1.31		
2013-14	8,054.44	0.00	68.92	-68.92	-7.75	-89.71	8.64		
2014-15	8,561.76	0.00	51.24	-51.24	4.94	26.24	18.83		

2015-16	7,812.21	0.00	128.30	-128.30	4.31	197.08	2.19		

(Compiled by the Author from Annual Reports)

Descriptive statistics	Total revenue	Foreign Exchange Inflow	Foreign Exchange outflow	Net Exposure	Net exchange (loss) /Gain	Net Profit	% of exchange loss on Net Profit
Mean	7073.43	0.00	130.65	-130.65	0.02	57.09	4.45
Standard Deviation	1233.42	0.00	106.21	106.21	4.52	140.58	7.12
Range	3412.80	0.00	294.76	294.76	12.69	367.81	21.01
Minimum	5148.96	0.00	24.95	-319.71	-7.75	-170.73	-2.19
Maximum	8561.76	0.00	319.71	-24.95	4.94	197.08	18.83
Sum	49514.03	0.00	914.55	-914.55	0.14	399.61	31.16

From the above table, it is possible to infer that total revenue earned by National Fertilizers Ltd. for the period of 2009 to 2016 is Rs.49514 Cr. out of which foreign exchange gain accrued to the company is Rs.14 lakhs. Average exchange gain amounted to be Rs.2lakhs. Average net exposure is -130.65 which 1.8% of average revenue is. Co efficient variation on exchange loss is about 226% (0.02/4.52) which indicates that the exchange gains are consistent to the extent of 226%.

During the reported period there was no inflows, only exchange outflows were persisting consequently net exposure happen to be –ve year on year. Hence, there is a need for internal and external foreign exchange risk management tools, which are inevitable to minimize the foreign exchange losses. Out of 7 years in four financial years' company had a foreign exchange gain.

NFL has not employed any of the four-currency derivative i.e. Forwards, Futures, options & swaps which would have been used to minimize its foreign exchange risk. It has an exposure in one majorly traded currency that is USD. The major reason would be exchange gain reported during the reporting period.

Table 3: *GujarathNarmadha Valley Fertilisers Ltd.*

(Rs.in Crores)

Year	Total revenue	Foreign Exchange Inflow	Foreign Exchange outflow	Net Exposure	Net exchange (loss) /Gain	Net Profit	% of exchange loss on Net Profit	Derivatives Used	Exposure in
2009-10	2700.73	5.92	325.87	-319.95	-6.94	123.84	-5.60	FORWARDS	USD
2010-11	2989.45	8.60	455.53	-446.93	-3.59	266.53	-1.35		
2011-12	3892.10	8.76	441.25	-432.49	-7.02	283.84	-2.47		
2012-13	4292.95	29.57	388.66	-359.09	-18.70	273.11	-6.85		
2013-14	4892.24	72.39	307.99	-235.60	-8.73	292.27	-2.99		
2014-15	4693.27	23.80	364.22	-340.42	4.51	-452.07	-1.00		
2015-16	4661.53	33.75	350.70	-316.95	-8.01	226.36	-3.54		

(Compiled by the Author from Annual Reports)

Descriptive statistics	Total revenue	Foreign Exchange Inflow	Foreign Exchange outflow	Net Exposure	Net exchange (loss) /Gain	Net Profit	% of exchange loss on Net Profit
Mean	4017.47	26.11	376.32	-350.20	-6.93	144.84	-3.40
Standard Deviation	4292.95	23.80	364.22	-340.42	-7.02	266.53	-2.99
Range	2191.51	66.47	147.54	211.33	23.21	744.34	5.85
Minimum	2700.73	5.92	307.99	-446.93	-18.70	-452.07	-6.85
Maximum	4892.24	72.39	455.53	-235.60	4.51	292.27	-1.00
Sum	28122.27	182.79	2634.22	-2451.43	-48.48	1013.88	-23.79

Fertiliser maker Gujarath Narmadha Valley Fertilisers Ltd. Has reported an average foreign exchange loss of Rs.6.93Cr. for the period 2009 to 2016. With a moderate range of 23.21 which is the indication of high volatility. CV of the firm's exchange loss is about 103.89% which is very consistent in terms of exchange loss accrued, it is also evident from the earlier table out of 7 years ,6 years it has reported exchange loss. Average exchange loss as a % on net profit is only 3.4%.

Average net exposure reported -350.20Cr, in all the 7 financial years' exchange inflows are lower than outflows. Hence, it calls for foreign exchange risk minimization techniques. Apart from internal techniques, it requires external mitigation tools.

Gujarath Narmadha Valley Fertilisers Ltd has employed only one currency derivative instrument i.e. Forwards, to minimize its foreign exchange risk. It has an exposure in only one majorly traded currencies that is USD.

Table 4: *Pidilite (Speciality Chemicals)*

(Rs.in Crores)

Year	Total revenue	Foreign Exchange Inflow	Foreign Exchange outflow	Net Exposure	Net exchange (loss) /Gain	Net Profit	% of exchange loss on Net Profit	Derivatives Used	Exposure in
2009-10	2051.20	184.20	267.80	-83.60	9.31	289.10	3.22	FORWARDS	USD, TAKKA AED, BATHT SGD, EGP, BR, RMB, QTR, LKR
2010-11	2530.20	239.80	390.10	-150.30	-0.84	304.00	-0.27		
2011-12	3017.40	266.20	463.70	-197.50	-8.49	334.40	-2.54		
2012-13	3614.50	320.70	511.70	-191.00	-0.46	460.70	-0.10		
2013-14	4168.80	397.40	584.80	-187.40	-5.12	468.60	-1.09		
2014-15	4724.20	417.30	639.80	-222.50	-2.46	501.80	-0.49		
2015-16	5110.30	433.60	621.30	-187.70	-2.92	703.00	-0.42		

(Compiled by the Author from Annual Reports)

Descriptive statistics	Total revenue	Foreign Exchange Inflow	Foreign Exchange outflow	Net Exposure	Net exchange (loss) /Gain	Net Profit	% of exchange loss on Net Profit
Mean	3602.37	322.74	497.03	-174.29	-1.57	437.37	-0.24

Standard Deviation	1136.60	96.68	134.68	45.27	5.53	145.26	1.74
Range	3059.10	249.40	372.00	138.90	17.80	413.90	5.76
Minimum	2051.20	184.20	267.80	-222.50	-8.49	289.10	-2.54
Maximum	5110.30	433.60	639.80	-83.60	9.31	703.00	3.22
Sum	25216.60	2259.20	3479.20	-1220.00	-10.98	3061.60	-1.69

Specialty chemical maker Pidilite Ltd. portrayed the following results for the reference period of 2009 to 2016. Total revenue of the company stood at 2051.20Cr. Whereas it reached to 5110.30Crs, the growth is witnessed with 13.92%p.a. net exposures were ranging at 138.90Crs, with lower and higher value of -83.60Cr to -222.50Cr. Average net exchange loss reported was Rs. 1.57Cr. with the mean of 0.24% on net profit. This value infers that company is having negligible amount of exchange loss.

Due to lean exchange loss margin on net profit and exposure in 9 different currencies apart from USD. It has used only forward to mitigate the foreign exchange risk.

Table 5: *Dcw Ltd.(Petro Chemicals)*

(Rs.in Crores)

Year	Total revenue	Foreign Exchange Inflow	Foreign Exchange outflow	Net Exposure	Net exchange (loss) /Gain	Net Profit	% of exchange loss on Net Profit	Derivatives Used	Exposure in
2009-10	1,029.14	94.5	883.50	-789	2.47	67.63	3.65	Forwards, swaps	USD
2010-11	1,074.10	150.83	1,117.70	-966.87	-0.27	28.91	-0.93		
2011-12	1,189.91	253.54	1,426.38	-1172.84	-34.22	30.67	-111.57		
2012-13	1,330.68	417.73	1,661.86	-1244.13	-16.88	104.89	-16.09		
2013-14	1,326.86	223.40	1,611.85	-1388.45	-31.42	37.87	-82.97		
2014-15	1,256.31	152.30	1,352.55	-1200.25	-14.95	-5.92	252.53		
2015-16	1,274.31	170.73	1,299.74	-1129.01	-16.95	18.54	-91.42		

(Compiled by the Author from Annual Reports)

Descriptive statistics	Total revenue	Foreign Exchange Inflow	Foreign Exchange outflow	Net Exposure	Net exchange (loss) /Gain	Net Profit	% of exchange loss on Net Profit
Mean	1211.62	209.00	1336.23	-1127.22	-16.03	40.37	-6.69
Standard Deviation	119.77	105.62	272.17	195.55	13.91	35.96	123.44
Range	301.54	323.23	778.36	599.45	36.69	110.81	364.11
Minimum	1029.14	94.50	883.50	-1388.45	-34.22	-5.92	-111.57
Maximum	1330.68	417.73	1661.86	-789.00	2.47	104.89	252.53
Sum	8481.31	1463.03	9353.58	-7890.55	-112.22	282.59	-46.81

Petro chemical maker DCW Ltd. portrayed the following results for the reference period of 2009 to 2016. Total revenue of the company stood at 1029.14Cr. Whereas it reached to 1274.31Crs, the growth is witnessed with 3.04%p.a. net exposures were ranging at 599.95Crs, with lower and higher value of -789 to -1388.5cR. Average net exchange loss reported was Rs. -16.03Cr. with the mean of 6.69% on net profit. This value infers that company is having substantial amount of exchange loss. The CV value is 86.77% that indicates the consistency of exchange loss.

Though the exchange loss margin on net profit higher than other chemical makers and exposure only in USD. It has used forward & swap to mitigate the foreign exchange risk.

Table 6: *Tata Chemicals Ltd.*

(Rs.in Crores)

Year	Total revenue	Foreign Exchange Inflow	Foreign Exchange outflow	Net Exposure	Net exchange (loss) /Gain	Net Profit	% of exchange loss on Net Profit	Derivatives Used	Exposure in
2009-10	9,712.36	114.81	1,928.84	-1,814.03	-22.48	723.58	-3.11	Forwards, Options, Swaps	USD, CHF, JPY, EURO, GBP, SGD, AUD, DKK, KES
2010-11	11,156.34	53.18	2,755.68	-2,702.50	-32.40	846.04	-3.83		
2011-12	13,973.87	158.08	4,092.86	-3,934.78	-127.38	1,039.51	-12.25		
2012-13	15,128.80	48.63	2,978.03	-2,929.40	-301.99	610.51	-49.47		
2013-14	16,037.85	58.19	3,046.78	-2,988.59	-198.16	-807.57	24.54		
2014-15	17,322.45	104.00	4,168.82	-4,064.82	-196.33	807.39	-24.32		
2015-16	17,830.73	65.79	3,192.42	-3,126.63	-156.25	979.87	-15.95		

(Compiled by the Author from Annual Reports)

Descriptive statistics	Total revenue	Foreign Exchange Inflow	Foreign Exchange outflow	Net Exposure	Net exchange (loss) /Gain	Net Profit	% of exchange loss on Net Profit
Mean	14451.77	86.10	3166.20	-3080.11	-147.86	599.90	-12.05
Standard Deviation	3060.02	40.84	776.09	761.46	98.47	637.40	22.55
Range	8118.37	109.45	2239.98	2250.79	279.51	1847.08	74.00
Minimum	9712.36	48.63	1928.84	-4064.82	-301.99	-807.57	-49.47
Maximum	17830.73	158.08	4168.82	-1814.03	-22.48	1039.51	24.54
Sum	101162.40	602.68	22163.43	-21560.75	-1034.99	4199.33	-84.38

Tata chemicals Steward in chemical industry was having revenue growth of 83% as compared base year 2009 to the current year 2016. Average revenue for the reporting period was 14451.77Cr. Average net exposure was Rs.-3080.11Cr. Exchange loss mean was Rs.-147.85Cr. which is consistent to the extent of 66%. It is inevitable to employ derivative tools to mitigate the foreign exchange loss.

All the seven year commencing from 2009 to 2016 net exposure remained negative and which constitutes 21.32% of' total revenue. Total foreign exchange loss for the seven year amounted Rs.1034.99Cr. which is 24.62% of net profit. Compared to any other company Tata chemical has to use all derivative tools to mitigate the same.

It has exposure in 9 currencies out which 4 majorly traded currencies USD, GBP, JPY & EURO were involved in its international operations. It has used Forwards, options & swaps to mitigate the exchange losses.

Table 7: *Monsanto Ltd.*

(Rs.in Crores)

Year	Total revenue	Foreign Exchange Inflow	Foreign Exchange outflow	Net Exposure	Net exchange (loss) /Gain	Net Profit	% of exchange loss on Net Profit	Derivatives Used	Exposure in
2009-10	422.68	10.58	65.09	-54.51	3.46	53.81	6.43	NIL	USD, EURO, BDT, NKR
2010-11	371.76	10.48	57.67	-47.19	-0.72	42.83	-1.68		
2011-12	388.92	15.470	68.03	-52.56	-0.97	50.19	-1.93		
2012-13	459.33	18.200	96.02	-77.82	-0.96	67.34	-1.43		
2013-14	594.76	28.380	91.95	-63.57	-1.77	122.89	-1.44		
2014-15	577.69	37.020	133.7	-96.68	-0.48	106.3	-0.45		
2015-16	555.75	34.630	91.08	-56.45	0.5	101.25	0.49		

(Compiled by the Author from Annual Reports)

Descriptive statistics	Total revenue	Foreign Exchange Inflow	Foreign Exchange outflow	Net Exposure	Net exchange (loss) /Gain	Net Profit	% of exchange loss on Net Profit
Mean	481.56	22.11	86.22	-64.11	-0.13	77.80	-0.0010
Standard Deviation	93.24	11.15	25.82	17.41	1.72	31.79	2.9569
Range	223.00	26.54	76.03	49.49	5.23	80.06	8.3627
Minimum	371.76	10.48	57.67	-96.68	-1.77	42.83	-1.9327
Maximum	594.76	37.02	133.70	-47.19	3.46	122.89	6.4300
Sum	3370.89	154.76	603.54	-448.78	-0.94	544.61	-0.0073

Average revenue reported by Monsanto for the reported period was Rs.481.56Cr where as its average net exposure is Rs-64.11Cr. Monsanto's average exchange loss is less than 1% which is 0.13%. It has exposure in 4 currencies. Hence exchange loss margin is very lean it has not employed any derivative instrument. Firm policy was convert receivable and payable at prevailing exchange rate.

Table 8: *UPL Ltd.*

(Rs.in Crores)

Year	Total revenue	Foreign Exchange Inflow	Foreign Exchange outflow	Net Exposure	Net exchange (loss) /Gain	Net Profit	% of exchange loss on Net Profit	Derivatives Used	Exposure in
2009-10	5,495.00	1,391.20	680.18	711.02	27.49	526.2	5.224646	Forwards, Swaps	USD, GBP, JPY, EURO, AUD, AED, CHF, DKK, NZD, CAD, PIN, MUR
2010-11	5,898.17	1,476.37	820.34	656.03	-106.99	557.6	-19.1869		
2011-12	7,764	1,741.85	860.44	881.41	52.97	555.6	9.534695		
2012-13	9,293	2,237.10	1,340.52	896.58	94.26	774.6	12.16886		
2013-14	10,902	2,941.21	1894.37	1046.84	57.93	949.8	6.099243		
2014-15	12,088	3,019.25	2,102.62	916.63	-204.82	1,123.9	-18.224		
2015-16	13,413	4,403.89	2,045.39	2358.5	-49.17	1,330.1	-3.6966		

(Compiled by the Author from Annual Reports)

Descriptive statistics	Total revenue	Foreign Exchange Inflow	Foreign Exchange outflow	Net Exposure	Net exchange (loss) /Gain	Net Profit	% of exchange loss on Net Profit
Mean	9264.72	2458.70	1391.98	1066.72	-18.33	831.11	-1.15
Standard Deviation	3045.74	1079.99	619.54	584.54	107.44	315.11	12.96
Range	7918.24	3012.69	1422.44	1702.47	299.08	803.98	31.36
Minimum	5495.00	1391.20	680.18	656.03	-204.82	526.16	-19.19
Maximum	13413.24	4403.89	2102.62	2358.50	94.26	1330.14	12.17
Sum	64853.05	17210.87	9743.86	7467.01	-128.33	5817.76	-8.08

Crop protection chemical maker UPL Ltd. Having average revenue of 9264.72Cr. for the reporting period 2009 to 2016 out which average net positive exposure was Rs.1066.72Cr. which is 11.51% of total revenue. Average exchange loss for the period 18.33Cr which 1.15% of net profit.

Due to meager exchange loss and 12 currencies used for the trade it has employed only forward and swaps to mitigate the exchange losses.

Table 9: *Godrej Industries Ltd.*

(Rs.in Crores)

Year	Total revenue	Foreign Exchange Inflow	Foreign Exchange outflow	Net Exposure	Net exchange (loss) /Gain	Net Profit	% of exchange loss on Net Profit	Derivatives Used	Exposure in
2009-10	3,715.53	299.7	242.11	57.59	2.43	203.24	1.195631	Forwards, Futures	USD, GBP, JPY, EURO, SGD, UAED,
2010-11	4,523.24	416.09	362.71	53.38	-1.19	293.39	-0.4056		
2011-12	5,710.03	583.26	415	168.65	-10.4	291.61	-3.56641		
2012-13	7,017.14	772.2	268	504.01	-2.23	391.18	-0.57007		
2013-14	8,073.72	513.19	428.7	84.49	-13.85	326.27	-4.24495		
2014-15	9,355.82	493.04	345.20	147.84	-8.13	402.47	-2.02003		
2015-16	10930.25	477.54	304.05	173.49	-1.53	484.43	-0.31584		

(Compiled by the Author from Annual Reports)

Descriptive statistics	Total revenue	Foreign Exchange Inflow	Foreign Exchange outflow	Net Exposure	Net exchange (loss) /Gain	Net Profit	% of exchange loss on Net Profit
Mean	7046.53	507.86	337.94	169.92	-4.99	341.80	-1.42
Standard Deviation	2605.15	146.33	70.69	155.79	5.87	91.98	1.95
Range	7214.72	472.50	186.59	450.63	16.28	281.19	5.44
Minimum	3715.53	299.70	242.11	53.38	-13.85	203.24	-4.24
Maximum	10930.25	772.20	428.70	504.01	2.43	484.43	1.20
Sum	49325.73	3555.02	2365.57	1189.45	-34.90	2392.59	-9.93

Commodity chemical & specialty chemical maker Godrej Industries Ltd. Has average exchange loss of 1.42%. It nets exposure remained positive for all the seven years. It has employed futures and forwards to mitigate the foreign exchange risk. It has exposure in all majorly traded currencies that is USD, GBP, EURO & JPY along with SGD, UAED.

Table 10: *Rashtriya Chemical Fertilisers Ltd.*

(Rs.in Crores)

Year	Total revenue	Foreign Exchange Inflow	Foreign Exchange outflow	Net Exposure	Net exchange (loss) /Gain	Net Profit	% of exchange loss on Net Profit	Derivatives Used	Exposure in
2009-10	5821.86	2.60	1363.74	-1361.14	-2.63	234.44	-1.12182	Forwards, Options, Swap	USD,
2010-11	5661.06	0.74	1039.03	-1038.29	40.77	244.71	16.66054		
2011-12	6600.44	1.82	1868.59	-1866.77	-3.81	248.83	-1.53117		
2012-13	6867.13	1.68	822.65	-820.97	-7.380	272.83	-2.70498		
2013-14	6662.49	1.68	258.17	-256.49	-58.060	241.09	-24.0823		
2014-15	7790.06	0.73	1103.6	-1102.87	-14.990	345.75	-4.3355		
2015-16	8,771.68	0.00	1129.8	-1129.8	23.760	185.21	12.82868		

(Compiled by the Author from Annual Reports)

Descriptive statistics	Total revenue	Foreign Exchange Inflow	Foreign Exchange outflow	Net Exposure	Net exchange (loss) /Gain	Net Profit	% of exchange loss on Net Profit
Mean	6882.10	1.32	1083.65	-1082.33	-3.19	253.27	-0.61
Standard Deviation	1090.70	0.87	491.37	491.26	31.16	48.59	13.22
Range	3110.62	2.60	1610.42	1610.28	98.83	160.54	40.74
Minimum	5661.06	0.00	258.17	-1866.77	-58.06	185.21	-24.08
Maximum	8771.68	2.60	1868.59	-256.49	40.77	345.75	16.66
Sum	48174.72	9.25	7585.58	-7576.33	-22.34	1772.86	-4.29

Rashtriya Chemical Fertilisers Ltd agro chemical maker has average exchange loss of -3.19Cr, which is 0.61% of net profit. Net exposure remained negative and consistent for all the 7 years, due to which it has employed forwards, options & swaps to mitigate the exchange losses. I have exposure only in USD.

H_{01}: Foreign exchange exposure among the chosen companies for remains uniform, irrespective of size of the firm

To test the above hypothesis ANOVA has been used. Below mentioned table comprises of net exposure i.e difference between Foreign exchange inflow and Outflow of 10 companies across the chemical industry for the period of 2009 to 2016.

Table 11: *Table Showing Net Exposure of Selected Company in Chemical Industry*

YEAR	GSFC	NFL	GNVF	PL	DCW	TC	MON	UPL	GOD	RSFC
2009-10	-1368.8	-94.24	-319.95	-83.6	-789	-1814.03	-54.51	711.02	57.59	-1361.14
2010-11	-1363.57	-24.95	-446.93	-150.3	-966.87	-2702.5	-47.19	656.03	53.38	-1038.29
2011-12	-1419.93	-319.71	-432.49	-197.5	-1172.84	-3934.78	-52.56	881.41	168.65	-1866.77
2012-13	-1337.79	-227.19	-359.09	-191	-1244.13	-2929.4	-77.82	896.58	504.01	-820.97
2013-14	-1458.7	-68.92	-235.6	-187.4	-1388.45	-2988.59	-63.57	1046.84	84.49	-256.49

2014-15	-1009.49	-51.24	-340.42	-222.5	-1200.25	-4064.82	-96.68	916.63	147.84	-1102.87
2015-16	-1368.41	-128.3	-316.95	-187.7	-1129.01	-3126.63	-56.45	2358.5	173.49	-1129.8

Table 12: *Anova Test Result*

ANOVA Single Factor Summary						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	79230529.3	9	8803392	69.52942	2.18E-28	2.040098
Within Groups	7596834.96	60	126613.9			
Total	86827364.3	69				

From the summary result, it is possible to infer that test is significant because the P value is less than 0.05 which is 2.18E-28. F calculated value is higher than the table value i.e., 69.52>2.04. This test resulted in rejection of H_{01} – null hypothesis and the alternative hypothesis is accepted.

There is no uniformity in exchange exposure which differs across the companies due to the tune of revenue, foreign exchange inflow and out flow.

H_{02}: Foreign exchange exposure has bearing on profitability of the firm to the greater extent.

To test the above hypothesis multiple regression test is used, the impact of exchange inflow, out flow, net exposure and exchange losses on net profit of chosen companies for the study. The result of which is as follows

Regression Statistics	
Multiple R	0.684886829
R Square	0.469069968
Adjusted R Square	0.42978527
Standard Error	259.7026515
Observations	70

ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	3932756	983189.0844	19.43672175	1.47277E-10
Residual	66	4451401	67445.46721		
Total	70	8384157			

	Coefficients	t Stat	P-value
Intercept	104.4874986	2.219865	0.029868
Exchange inflow	0	65535	
Exchange out flow	0.372883415	7.014595	
Net exposure	0.222510776	5.456256	7.86E-07
Exchange loss	0.327348736	0.483154	0.630585

Regression Test static infers the following. The test considered to be significant because Multiple R Value is 0.689 that indicates high degree of impact exists between foreign exchange exposure on foreign exchange losses. In other words, Probable exchange losses can be estimated to the extent of 68% of foreign exchange exposure of the in chemical industry. R square indicates degree of correlation coefficient between exchange exposure and exchange losses.

P value of test static is less than 0.05 which is 7.86E-07 which reveals that the test is significant in context of exchange exposure has an impact on exchange losses of the firm, compared to exchange inflow and outflow independently.

From the above table values it is possible to derive the equation i.e., Y = a + bx

Exchange losses of chemical industry = 104.48 + exchange exposure (0.22)

For the total observation of 10 chemical makers for the data of 7 years F test static19.43672175>1.47277E-10 i.e. infers to reject the null hypothesis and accept the alternative hypothesis. Foreign exchange exposure does not have substantial bearing on profitability of the firm.

H_{03}: Foreign exchange losses can be substantially minimised through currency derivatives and multiple currency invoicing

Regression Statistics	
Multiple R	0.399
R Square	0.159
Adjusted R Square	0.134
Standard Error	57.894
Observations	70

ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	2	42734.308	21367.15	6.3748	0.002921
Residual	67	224571.89	3351.819		
Total	69	267306.19			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	21.83	14.35	1.52	0.133
NO.D	-16.08	5.54	-2.90	0.005
NO.C	-3.46	1.67	-2.06	0.0425

To test the above specified hypothesis multiple regression test is used. The summary output of the test infers that, test is significant because P value of no. of derivative instrument used & multiple currency invoicing are lower than 0.05. i.e. 0.005, 0.0425 < 0.05. Multiple R 0.399 indicates that to the extent of 39% exchange losses can be minimized through currency derivatives and multiple currency usage, whereas these parameters are having correlation in the tune of 16%.

From the above table values it is possible to derive the equation i.e., Y = a + bx + ej

Exchange losses of chemical industry can be minimized = 21.83 +No. Derivatives used (-16.08) + No. of currencies used for invoicing (-3.46) + 14.35.

For the total observation of 10 chemical makers for the data of 7 years F test static. 6.378 > 0.00291 i.e., infers to reject the null hypothesis and accept the alternative hypothesis. Foreign exchange losses cannot be completely minimized through employing number of currency derivatives & multiple currency invoicing.

Findings of FERM Practises of 10 Selected Companies of Chemical Industry

1) Total revenue reported by 10 chemical manufacturers for 7 years commencing from 2009 to 2016 was Rs. 4, 16,255.68Crs with the average of 5946.71 Cr.p.a per company.
2) Total foreign exchange earned by 10 chemical manufacturers for 7 years commencing from 2009 to 2016 was Rs25, 947.23Cr. Average foreign exchange earnings were Rs.370.67Cr. p.a. per company.
3) Total foreign exchange used for import of raw materials, capital goods, payment for services & dividend remittances of 10 chemical manufacturers for 7 years commencing from 2009 to 2016 was Rs68, 679.85Cr. Average foreign exchange outflow were Rs.981.14Cr. p.a. per company.
4) Net exposure were adverse Rs. -42732.62Cr. with the average of 610.47per company p.a.
5) Exchange losses were Rs. -1614.17Cr with the average loss of 23.06Cr per company p.a. exchange loss on margin was 2.75%
6) No. of currency derivatives used and exposure in currencies of chosen companies were as follows

Company Name	No. of currency derivatives used	No. of currency derivatives used	exposure in currencies	No. of currencies
GSFC Ltd.	Futures, forwards, options & swaps, Un hedged	4	USD,EURO	2
National Fertilisers Ltd.	Remain Un hedged	nil	USD	1
GNVF Ltd.	Forwards & Un hedged	1	USD	1
PIDILITE	Forwards & Un hedged	1	USD, TAKKA AED, BATHT SGD, EGP, BR, RMB, QTR, LKR	10
DCW LTD	Forwards, Swaps & un hedged	2	USD	1
TATA CHEMICALS	Forwards, options & swaps, Un hedged	3	USD, CHF, JPY, EURO, GBP, SGD, AUD, DKK, KES	9
Monsanto	Un hedged	0	USD, EURO, BDT, NKR	4
UPL limited	Forwards, Swaps & un hedged	2	USD, GBP, JPY, EURO, AUD, AED, CHF, DKK, NZD, CAD, PIN, MUR	12
Godrej industries Ltd.	Forwards, Futures & un hedged	2	USD, GBP, JPY, EURO, SGD, UAED,	5
Rastriya chemicals and fertilisers limited	Forwards, options & swaps, Un hedged	3	USD	1

Out of 10 companies chosen for the study 100% of companies some portions of outflow and inflow of foreign exchange remained un hedged. Out which 2 companies Monsanto & national fertilisers limited has not used any currency derivatives. 4 companies are using swaps, 8 companies are using forwards, futures are used by 2 companies & 3 companies are using options to mitigate the foreign exchange risk. It is evident from the above analysis even after introduction of futures and options on currencies, currency derivatives are referred as forwards to the extent of 80% among the Indian listed chemical makers.

7) There is no uniformity in exchange exposure which differs across the companies due to the tune of revenue, foreign exchange inflow and out flow.
8) For the total observation of 10 chemical makers for the data of 7 years F test static 19.43672175 > 1.47277E-10 i.e., infers to reject the null hypothesis and accept the alternative hypothesis. Foreign exchange exposure does not have substantial bearing on profitability of the firm.
9) For the total observation of 10 chemical makers for the data of 7 years F test static. 6.378 > 0.00291 i.e., infers to reject the null hypothesis and accept the alternative hypothesis. Foreign exchange losses cannot be completely minimized through employing number of currency derivatives & multiple currency invoicing.

SUGGESTIONS

1) Currency futures and options usage is minimal among chemical makers, which can be popularized by rendering appropriate training to the finance managers, instead of using only forwards or un hedged positions.
2) Irrespective of size of the firm, futures and options can be deployed, cost of forwards as same as futures and options
3) Premium on options and margins on futures can be minimized, if the contracts are undertaken for hedging purpose.
4) Interest rate derivatives can be used along with currency derivatives which would nullify the ups and downs in both the instruments.
5) External commercial borrowings or money market operations of chemical industry participants can be replaced with swaps contract.
6) Around 96% trading in currency derivative market is on USD instead of it other less volatile currencies can be traded which can be used by the chemical industries to minimize the exchange losses.

REFERENCES

[1] Belk and Glaum (1990) “The Management of Foreign Exchange Risk in UK Multinationals: An Empirical Investigation” Article *in Accounting and Business Research 21* (81), pp. 3 – 13, December 1990, A research quarterly published by the Institute of Chartered Accountants in England and Wales

[2] Batten, J., Mellor, R. and Wan, V., (1993) “Foreign Exchange Risk Management Practices and Products Used by Australian Firms”, *Journal of International Business Studies, 24* (383), pp. 557 – 573.

[3] Bodnar, G.M., G. Hayt, R.C. Marston, and C.W. Smithson, (1995), “Wharton Survey of Derivatives Usage by U.S. Non-Financial Firms,” *Financial Management, 24* (2), pp. 104–114.

[4] Jesswein, Kwok and Floks (1995) “What New Currency Risk Products Are Companies Using, And Why? “ *Journal of Applied Corporate Finance, 8* (3), pp. 103 – 114.

[5] Grant and Marshall (1997) Grant, K. and Marshall, A. P., (1997), “Large UK Companies and Derivatives”, *European Financial Management, 3* (2), pp.191 – 208.

[6] Annual Reports of the Companies Chosen for the Study available at BSE.